sPHENIX Risk Management

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Risk Registry

- A “risk” is an event that has the potential to cause an unwanted change in the project.
- When identifying a risk, it should be stated clearly in terms of both the risk event and the consequences to the project.
- The format for the risk identified should be cause/risk/effect.
- A risk trigger is an event that indicates that a risk may be about to occur
- The trigger is then assigned a date to allow to monitor the trigger.
- After the risk mitigation approach is identified and a decision made to implement the mitigation, the mitigation cost becomes part of the line item cost and not the contingency.
- Only the remaining residual risk should be included in the risk register and contingency analysis.

The sPHENIX WBS Level 2 managers are responsible for:

- Identifying potential risks to the technical, cost, and schedule success of their WBS system, determining the likelihood of occurring, and estimating the potential impact on the project. This risk analysis is performed down to the deliverable level, usually WBS Level 3 or 4.
- Developing and executing risk abatement strategies for their Level 2 system.
- Informing the PM about the significant risks and the status of risk abatement strategies.
- Serving as members of sPHENIX RMB.

Project Risk	Significant risks
Facilities and Equipment	Major equipment development. Inadequate planning for long lead items and vendor support.
Design	Design relies on immature technologies or "exotic" materials to achieve performance objectives. Design not cost effective.
Requirements	Operational requirements not properly established or vaguely stated. Requirements are not stable. Requirements are too restrictive – cost risk.
Testing/ Evaluation/ Simulation	Test planning not initiated early in program (initiation phase). Testing does not address the ultimate operating environment. Test procedures don't address all major performance and suitability specifications. Facilities not available to accomplish specific tests, especially system-level tests. Insufficient time to test thoroughly. Project lacks proper tools and modeling and simulation capability to assess alternatives.
Schedule	Funding profile not stable from budget cycle to budget cycle. Schedule does not reflect realistic acquisition planning. Schedule objectives not realistic and attainable. Resources not available to meet schedule.
Supplier Capabilities	Inadequate supportability late in development, resulting in need for engineering changes, increased costs, and/or schedule delays. Restricted number of available vendors. Restricted production capacity.
Cost	Realistic cost objectives not established early. Funding profile does not match acquisition strategy.
Technology	Project depends on unproven technology for success with no alternatives. Project success depends on achieving advances in state-of-the-art technology. Potential advances in technology will result in less than optimal cost-effective system or make system components obsolete. Technology has not been demonstrated in required operating environment. Technology relies on complex hardware, software, or integration design.

Risk Category			
Project Impact	High	Moderate	Low
Cost	Closely monitor cost and spending. Consider implementing phased procurements. Obtain multiple bottoms-up independent cost estimates Perform Value Engineering Visit Vendor.	Closely monitor cost and spending. Obtain at least two bottoms-up independent cost estimates.	Quality controls applied as defined in the BNL Quality Management Plan.
Schedule	Increase lead time substantially by initiating procurements 6 - 8 weeks early. Visit Vendor. Evaluate in-house procurement. Contract incentives and/or penalties. Maintain vendor oversight.	Increase lead time by initiating procurements 2 - 4 weeks early. Visit Vendor. Evaluate in-house procurement. Contract incentives and/or penalties. Maintain vendor oversight. Add additional vendors.	Quality controls applied as defined in the BNL Quality Management Plan.
Performance	Perform major redesign. Increase prototype cycles. Evaluate alternate technology. Request additional process control steps during fabrication. Define extensive QA and/or acceptance testing. Increase lead time and/or increase testing cycles.	Moderate redesign as required. Define QA and/or acceptance testing. Increase prototype acceptance tests.	Quality controls applied as defined in the BNL Quality Management Plan.

Table 3: Impact Assessment Matrix for Project-Level Global Risks

Impact Risk Area	Low	Moderate	High
Cost:	≤ $250K	≤$500K	>$500K
Schedule:	Delays Level 2 milestone or Project critical path by ≤3 month	Delays Level 2 milestone or Project critical path by ≤6 months	Delays Level 2 milestone or Project critical path by >6 months
Scope/Technical:	Negligible, if any, degradation.	Significant technical/scope degradation.	Baseline scope or performance requirements will not be achieved.

Table 6: Risk Classification Matrix

	Impact		
Probability	**Low**	**Moderate**	**High**
High (probability > 75%)	Moderate	High	High
Moderate (25% < probability < 75%)	Low	Moderate	High
Low (probability < 25%)	Low	Low	Moderate

Owner	WBS	Risk Name	Risk trigger (if)	Consequences (then)	Timeframe	Probability	Impact	Rank	Mitigation Plan
E.O'Brien	1.1 Management	Departure of Key Personnel	Someone critical to the Project informs of his intention to leave sPHENIX	Schedule delay occurs	all	10%	Schedule: 3 months	Low	Closely work with sPHENIX collaboration to identify a potential replacement.
E.O'Brien	1.1 Management	Safety incident	Safety incident resulting in injury	Schedule delay occurs	all	5%	Schedule: 1 month	Low	Carefully plan all work in accordance with BNL SBMS. Include safety reviews and safety review recommendations implementation in sPHENIX resource loaded schedule.
E.O'Brien	1.1 Management	Funding profile stretches	Funds not available on time	Cost increases because procurements need to be broken down into smaller units, or existing quotes expire, or new contracts need to be negotiated.	production	50%	Schedule: 12-24 months Cost: $500K	High	Work closely with the funding agency so any funding profile changes can be evaluated as early as possible and sPHENIX Project schedule optimally adjusted to match the new funding profile.
E.O'Brien	1.1 Management	Infrastructure support delayed	Infrastructure milestone is delayed	Project activities dependent on Infrastructure milestone are delayed	all	5%	Schedule: 2 months	Low	Develop a detailed resource loaded schedule with key milestones for Infrastructure support and closely monitor this schedule for risk triggers.

Owner	WBS	Risk Name	Risk trigger (if)	Consequences (then)	Timeframe	Probability	Impact	Rank	Mitigation Plan
S. Stoll	1.3 EmCal	Loss of W powder supplier	Failure of the primary supplier (Tungsten Heavy Powder) to provide a quote for full powder order at an affordable price or will not sign a contract with BNL to deliver powder.	Would need to obtain quote and contract with different supplier for powder. This will cause a delay in the schedule and possibly an increase in cost. In addition, powder from a different vendor could lead to poorer detector performance	production	Low 20%	High cost: price increase > $500k. schedule: 9 mo to rebid/ negotiate contract/ place order.	Moderate	Find another source of W powder which can meet our specs. Some have already been investigated. Attempt to identify primary source of raw powder in China and identify new distributor. Accept degraded detector performance if new powder does not meet specs.
S. Stoll	1.3 EmCal	Loss of SciFi supplier	Failure of fiber vendor to sign contract or deliver fiber on time.	Would cause a delay in the schedule and result in higher cost for the fiber	production	Moderate 30%	Moderate cost: $1.4M higher cost for alternate supplier	Moderate	Two suppliers have been identified. We believe both can meet our specs, but one is roughly 2X high cost. If lower priced supplier cannot deliver then we must use contingency to purchase from other supplier.
S. Stoll	1.3 EmCal	Loss of primary production site for blocks (University of Illinois Urbana Champaign	UIUC decides to not fabricate the absorber blocks	Would cause a delay in schedule and a significant increase in labor resources required to build the blocks at BNL.	production	Low 20%	High cost: schedule: 12 mo. Delay	Moderate	Blocks would have to be built at BNL. However, we would also loose scientific oversight provided by UIUC, student labor, free use of facilities, space, etc.
S. Stoll	1.3 EmCal	Cannot find cost effective solution for making light guides	R&D studies and beam tests do not lead to improvements in the light collection uniformity from the modules	Will require position dependent correction for obtaining the desired energy resolution from the detector	R&D phase	Moderate 60%	Low - scope: possibly reduced energy resolution.	Low	We will have optical quality injection molded light guides produced with what we believe will be the optimal shape given the space constraints of the detector. The resulting energy resolution will be measured in a beam test.

Owner	WBS	Risk Name	Risk trigger (if)	Consequences (then)	Timeframe	Probability	Impact	Rank	Mitigation Plan
J. Lajoie	1.4 HCal	Loss of scintillating tile provider (Uniplast)	Uniplast is unable to engage in or complere the production contract	Schedule delay in the procurement of rthe scintillating tiles, along with correspond delays in inner and outer HCAL assembly.	production	10%	Schedule: 6-9 months	Moderate	Explore alternate scintillator vendors (FNAL, Elgin, IHEP).
J. Lajoie	1.4 HCal	Unable to produce inner HCAL in SS310 in a cost effective manner	Evaluation of inner HCAL prototype yields higher than anticipated production costs	Schedule delay in finalizing the design of the inner HCAL; re-engineering required.	production	25%	Schedule: 6 months	Moderate	Investigate value-engineering designs and alternate materials (brass); will require re-engineering.
J. Lajoie	1.4 HCal	Unable to identify suitable site(s) for inner HCAL assembly (scint. and electronics)	No participating University site can idetify the space resources for assembly.	Schedule delay to set up assembly site at BNL	production	5%	Schedule 3 months	Low	Investigate possibility of assembly (scintillator and electronics) at BNL.

26	Owner	WBS	Risk Name	Risk trigger (if)	Consequences (then)	Timeframe	Probability	Impact	Rank	Mitigation Plan
27	E. Mannel	1.5 Cal Electronics	Delay in SiPM Delivery	SiPM order not placed on schedule or vendor unable to meet prodcution schedule	Delay in assembly of Hcal and EMCal SiPM daughter boards. Potential delay in Hcal and EMCal module assembly	Procurement	Moderate: 50%	Low: Schedule delay 2-3 months	Low	Closely monitor the procurement stage.
28	E. Mannel	1.5 Cal Electronics	Delay in testing of SiPMs	SiPM Delivery not placed on schedule or vendor unable to meet prodcution schedule	Delay in assembly of Hcal and EMCal SiPM daughter boards. Potential delay in Hcal and EMCal module assembly	Production	Moderate: 50%	Low: Schedule delay 2-3 months	Low	Increase number of testing stations. Identify additional collaborators who can contribute to the testing program. Streamline testing program.
29	E. Mannel	1.5 Cal Electronics	Delay in Assembly of HCal Daughter boards, Preamps, Interface boards, LED Drivers	Procurement of components, issuing of orders.	Potential delay in HCal module assembly and testing	Production	Moderate: 25%	Low: Schedule delay 2-3 months	Low	Staged partial deliveries of boards. Use multiple assembly houses
30	E. Mannel	1.5 Cal Electronics	Delay in assembly of EMCal Daughter boards, Preamps or Interface boards	Procurement of components, issuing of orders.	Potential delay in EMCal module assembly and testing	Production	Moderate: 25%	Low: Schedule delay 2-3 months	Low	Staged partial deliveries of boards. Use multiple assembly houses

Owner	WBS	Risk Name	Risk trigger (if)	Consequences (then)	Timeframe	Probability	Impact	Rank	Mitigation Plan
M. Purschke	1.6 DAQ/ Trigger	DAQ Prototype		DAQ prototype throughput and performance is below specifications				Low	Acquire more expensize PCs / re-design parts of the architecture
M. Purschke	1.6 DAQ/ Trigger	Network switch		Network switch more expensive than projected				Low	try to use "software" switch / cascading of cheaper, smaller switches
M. Purschke	1.6 DAQ/ Trigger	Global Lvl1		adaptation of PHENIX GL1 runs into obstacles				Low	select different card, re-design parts of the architecture
M. Purschke	1.6 DAQ/ Trigger	Timing System		Conversion/adaptation from GLINK problematic, or envisioned replacement board cannot be used				Low	select different card, re-design parts of the architecture
M. Purschke	1.6 DAQ/ Trigger	Local LVL1		Performance of LLVL1 algorithms inadequate. Trigger latency too high.				Moderate	prioritize Physics goals, procure more hardware
M. Purschke	1.6 DAQ/ Trigger	Storage		Data volume, especially from the TPC, too high				Moderate	invest in more local storage, change compression algorithms

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M. Chiu	1.7 MinBias	Acquire permission to use PHENIX BBC	Permission is denied by Hiroshima U.	Need to use alternative detector.	Fall 2017	2%	Cost: $100K, Schedule: 1 year	Low	Use scintillator BBC or another alternative
M. Chiu	1.7 MinBias	Magnetic field capability of BBC PMTs	Testing shows PMT gain drops below spec for B-field at MBD location.	Must move MBD further away in z, losing some MB efficiency	All	2%	Cost: $0, Schedule: 0 months	Low	Testing mesh dynode PMTs to remove uncertainty in B-field performance. Worst case, move BBC to z=±300 cm, where the field is low enough and is known to have been OK in PHENIX

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T. Hemmick	1.2 TPC	Procure v1a GEMs				Low	Low	Low	In case the proper GEMs for the v1a prototype are not in hand, an adapter plate will be requires to fit an existing GEM-stack to allow the magnet test to proceed.
T. Hemmick	1.2 TPC	Performance failure of v2 prototype				Low	Moderate	Moderate	We will add a design cycle of a smaller device than the full sized field cage if the v1 prototype fails. We will proceed on v2 only after success of the small version.
T. Hemmick	1.2 TPC	Failure or delay of CERN production				Low	High	Moderate	We will monitor carefully the success of CERN foil production and will hire a technician who will exclusively work on producing GEM foils for our project. If delays still occur, we will seek a second vendor (e.g. Tech Etch).
T. Hemmick	1.2 TPC	SAMPA Chip Failure				Low	High	Moderate	ALICE and STAR shall be forced to mitigate the situation and if not, alternatives such as the sALTRO and DREAM chips must be considered.